

PALLIMNARCHUS AND OTHER CENOZOIC CROCODILES IN QUEENSLAND

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ABSTRACT.

Pallimnarchus pollens is a valid crocodilian taxon, based on a lectotype (articulated dentaries) selected in this paper. Much material that has been referred to *P. pollens* is attributable to *Crocodylus porosus* or is indeterminate at present. *Crocodylus nathani* is a junior subjective synonym of *C. porosus*. Both *P. pollens* and *C. porosus* date back into the Pliocene (*P. pollens* in the Chinchilla Sand and *C. porosus* in the Allingham Fm). *C. porosus* remains, including the material from 'Lansdowne' near Tambo previously referred to *P. pollens*, indicate a former range into the interior waterways of Queensland. There is no recognizable fossil material of *C. johnsoni*. A dentary fragment from near Murgon (S.E. Qld) resembles material from the Etadunna and Waite Fms. of central Australia.

INTRODUCTION

Late last century de Vis (1886) recognized a large extinct Queensland crocodilian that appeared to differ from living crocodilians in the possession of a broad snout and imbricated dermal scutes. De Vis informally designated this beast *Pallimnarchus pollens*, and he and H.A. Longman (1925, 1926) carried out further work on it. The name gained widespread useage in the Australian secondary and popular literature (e.g. Jack and Etheridge, 1892; Laseron, 1950; Mincham, 1967). More importantly, much Plio-Pleistocene crocodilian material, especially in the Queensland Museum collections, has been referred to this taxon.

Longman (1924) described *Crocodylus nathani*, to which further material was never referred. Much of the material referred to *P. pollens* and the *C. nathani* specimen appeared to be indistinguishable from *Crocodylus porosus*. Type material was never designated for either of these two species.

The present study nominates lectotype material for both *P. pollens* and *C. nathani*. As the descriptions of de Vis and Longman are largely accurate and comprehensive, little further detailed description is presented here: however some material is newly illustrated with photographs. Much material of *Pallimnarchus* has been referred on the form of the armour. This is not discussed here because no armour is unambiguously associated with the lectotype material, and a collection of modern material sufficient for

comparison and study of variation is not available to me. Nor is the generic status of *Pallimnarchus* discussed, pending study of a similar Miocene crocodilian from South Australia. The lectotype material is more restricted than that used by de Vis (1886) in forming his concept of *Pallimnarchus*, indeed that material (see below) probably pertains to three distinct taxa. Since the extent of differences from *Crocodylus* cannot be adequately assessed, the genus *Pallimnarchus* is herein tentatively accepted.

In addition to *P. pollens* and *C. nathani*, a probably Miocene crocodile dentary fragment from near Murgon, southeast Queensland, is described and illustrated to round out this study of fossil crocodilian material from Queensland. Ziphodont crocodilians, recently studied (Molnar, 1981) are not discussed.

Pallimnarchus pollens de Vis 1886

PREVIOUS WORK.

De Vis (1886) listed and described crocodilian material presumably from 'the Condamine drift' (1886, p. 182) to which was appended 'The cabinet name, *Pallimnarchus pollens* . . . (as); merely one of convenience.' (de Vis, 1886, p. 191). This name however has been subsequently treated as both valid and formally proposed (e.g. Jack and Etheridge, 1892; Longman, 1925; Steel, 1973). There has been no restudy of de Vis' material, Longman (1925; 1926) having referred to it only

insofar as relevant to the description of newly discovered material, so that this study constitutes the first revision of de Vis' taxon.

De Vis did not designate a type specimen for *Pallemnarchus pollens*, but described together material from four (possibly five) individuals of at least two, probably three, different taxa. De Vis' intention with regard to the type material cannot be deduced from the labels or the register entries, as the former treat all the specimens described by de Vis (1886), with the exception of the maxillary piece, as syntypes, while the register designates QM F1149 (two articulated dentaries) as the type. The maxillary piece figured by de Vis (1886, pl. X) was not recognised in the collections.

DESIGNATION OF LECTOTYPE OF *P. POLLENS*.

QM F1149 (Pl. 1, Figs. A,B) is the most complete of the specimens used by de Vis in the original description of *P. pollens*, and was figured by him (de Vis, 1886, pl. 10, fig. 1). This specimen matches both description and illustration, so there can be no doubt that QM F1149 is in fact the specimen used by de Vis. It also best illustrates the distinctive features of the taxon, and thus is here designated the lectotype. It includes the anterior portions of both dentaries, fused at the symphysis and lacking all but two teeth. This number also includes a fragment of the left angular not sharing any contact with the dentaries, but of appropriate size and preservation to pertain to the same individual. This angular (Pl. 2, Fig. 1) differs from that of *Crocodylus porosus*, but is generally similar to the corresponding portion of the angular of *Crocodylus johnsoni*. In view of this similarity, and in the absence of any evidence of association

between these pieces, the angular has been re-registered as QM F11610: nonetheless it is possible that it does pertain to the lectotype specimen of *P. pollens*.

The type jaws of *P. pollens* represent an immature individual, probably about three metres long (judging from comparison with *C. porosus*). The current disposition of the remaining material discussed by de Vis (1886) is given in Table 1. The only locality information for any of these specimens is that given by Jack and Etheridge (1892) and they do not indicate which specimens came from which localities. One of the listed localities (Eight Mile Plains) is at Brisbane, one (Gowrie Ck.) is on the eastern Downs, two (Wiembilla Ck., Chinchilla) on the western Downs, and the last (Condamine River) traverses both eastern and western Downs. Because de Vis (1886) implied that the specimens came from the Downs, and because their preservation is consistent with such an origin, it is assumed that the lectotype derives from the Pliocene or Pleistocene sediments of the Darling Downs.

Order: CROCODILIA
Suborder: EUSUCHIA Huxley
Family: Crocodylidae Cuvier
Genus: *Pallimnarchus* de Vis 1886

TYPE SPECIES: *Pallimnarchus pollens* de Vis 1886.

DIAGNOSIS: As only a single species is attributed to this genus the generic diagnosis cannot be separated from the specific diagnosis.

TABLE 1: DISPOSITION OF DE VIS' (1886) CROCODILIAN MATERIAL

Elements	Specimen	Taxon	Comments
anterior portions of both mandibles	QM F1149	<i>P. pollens</i>	Here designated the lectotype
angular, incomplete	QM F11610	<i>P. pollens?</i>	Initially numbered QM F1149 (see text)
symphyseal portion of left mandible	QM F1155	<i>P. pollens</i>	See text
incomplete right surangular	QM F1150	<i>C. porosus</i>	Shows no distinction from <i>C. porosus</i>
incomplete left premaxilla	QM F1151	<i>P. pollens?</i>	See text
posterior part of maxilla	?	?	Not recognized
left jugal	QM F1152	<i>Q. fortirostrum?</i>	See Molnar (1981)
anterior portion of skull roof	QM F3303	<i>C. porosus?</i>	See text
incomplete right quadrate	QM F1160	<i>P. pollens?</i>	See text

Species: *P. pollens* de Vis 1886

Pallimnarchus pollens de Vis 1886 *partim*.

Pallimnarchus pollens de Vis 1907 *partim*.

Pallimnarchus pollens Longman 1926, but not

Pallimnarchus pollens Longman 1925.

LECTOTYPE SPECIMEN: QM F1149. Anterior portions of both dentaries, articulated at the symphysis (Pl. 1, Figs. A, B).

LOCALITY: Unknown, probably on the Darling Downs southeast Queensland.

HORIZON: Unknown, probably Pliocene or Pleistocene.

DIAGNOSIS: Symphyseal portion of mandibles broader than in any living species of *Crocodylus*; angle between ramus of mandible and plane of symphyseal surface greater than in either *C. porosus* or *C. johnsoni*.

REFERRED MATERIAL: QM F11612, Chinchilla Sand, Chinchilla, late Pliocene; QM F1538, unknown age, Leichhardt River; QM F1155, Pleistocene?, eastern Downs?; AM F36947, Pleistocene?, Gregory River?, all of which are symphyseal portions of dentaries; and, QM F2025, Pleistocene?, Macalister, half of right dentary. Material probably referable to *P. pollens*: QM F1151, Pleistocene?, eastern Downs?; QM F1154, Chinchilla Sand, Chinchilla, both premaxillae, late Pliocene; QM F1160, Pleistocene?, eastern Downs?; QM F1166, Chinchilla Sand, Chinchilla, Late Pliocene, both quadrates; and, QM F1165, unknown age, unknown locality, the anterior portion of a dentary. Contrary to my previous belief (Molnar, 1981, p. 824) there is no evidence for a second non-zipodont crocodile at Chinchilla.

COMPARISON.

MANDIBLES. As noted by de Vis the mandibles of *Pallimnarchus* give the immediate impression of being broader than those of *C. porosus* (and much broader than those of *C. johnsoni* or *C. novae-guineae*). All of the sufficiently well preserved Plio-Pleistocene mandibles were measured, together with those of available modern Australasian crocodylians (Table 2), to allow comparison. The following characters were used in the comparison: i, alveolar diameters; ii, interalveolar distances; iii, position of anterior end of splenial with respect to tooththrow; iv, position of posterior end of symphysis with respect to

tooththrow; v, angle of divarication of the mandibles, and; vi, an index of the length to breadth ratio of the symphyseal platform.

Characters i to iv revealed no consistent differences between *P. pollens* and *C. porosus*; but the last two characters were clearly different. The angle of divarication was taken to be the angle in the horizontal plane between the symphyseal surface and the medial surface of the mandibular body. Since many of the fossil specimens had been disarticulated at the symphysis, the angle was measured separately for each side. These angles are given in Table 3. As some of the fossil jaws were lacking the anterior extremity of the first

TABLE 2: MATERIAL EXAMINED

Crocodylus porosus

AM R32645
AM R 71296
AM R71297
AM R71298
AM S1671
NMV 58499
NMV D55277
NMV R1580
NMV R4224
NMV R9920
QM F1161 *
QM J5005
QM J13443
QM J22550
QM J24495
QM J28902
QM J29021
QM J39231
QM J39232
QM J39233
QM J39283
QM J39284

Crocodylus johnsoni

QM J4280
QM J4281
QM J22551
QM J28895
QM J29021
QM J29022
QM J39230

Crocodylus novae-guineae

QM J5332
QM J5664

Pallimnarchus pollens

AM F36947 *
QM F1149 *
QM F1155 *
QM F1538 *
QM F2025 *

AM, Australian Museum, Sydney; NMV, National Museum of Victoria, Melbourne; QM, Queensland Museum, Brisbane: *, fossil material.

alveolus, rather than use the anteroposterior length of the symphysis in determination of the length to breadth ratio of the symphyseal platform, the distance from the posterior extremity of the symphysis (sometimes on a low genial tubercle) to the nearest portion of the first alveolus was used (Fig. 1). This allowed a larger sample for comparison. This index of length was plotted against the maximum breadth of each dentary at the symphyseal platform, from the symphyseal surface to the lateral margin (invariably at the fourth alveolus) and the results are given in Fig. 1. Again the individual dentaries were measured because of disarticulation of the fossil material.

Both characters verify that the mandibles of *P. pollens* are distinctly broader than those of *C. porosus*. Indeed for the length: breadth index, *P. pollens* is as distinct from *C. porosus* as is the latter from *C. johnsoni*. The wide range of sizes for *C. porosus* implies considerable age variation. These characters clearly distinguish *P. pollens* from *C. porosus* and *C. johnsoni*, and by implication, from *C. novae-guineae* (for which an

TABLE 3: ANGLE OF DIVARICATION OF DENTARY RAMUS FROM SYMPHYSEAL SURFACE

Taxon	Number	Side	Angle (°)
<i>C. porosus</i>	NMV D55277	r	17
<i>C. porosus</i>	NMV D55277	l	15
<i>C. porosus</i>	NMV R1580	r	14
<i>C. porosus</i>	NMV R1580	l	12
<i>C. porosus</i>	NMV R4224	r	22
<i>C. porosus</i>	NMV R4224	l	20
<i>C. porosus</i>	QM J5005	r	17
<i>C. porosus</i>	QM J5005	l	17
<i>C. porosus</i>	QM J22550	r	18
<i>C. porosus</i>	QM J22550	l	17
<i>C. porosus</i>	QM J28902*	r	21
<i>C. porosus</i>	QM J28902*	l	18
<i>C. porosus</i>	QM J39231	r	16
<i>C. porosus</i>	QM J39231	l	18
<i>C. porosus</i>	QM J39232	r	18
<i>C. porosus</i>	QM J39232	l	16
<i>C. porosus</i>	QM J39233	r	19
<i>C. porosus</i>	QM J39233	l	16
<i>P. pollens</i>	QM F1149**	r	23
<i>P. pollens</i>	QM F2025	r	26

* juvenile specimen

**lectotype

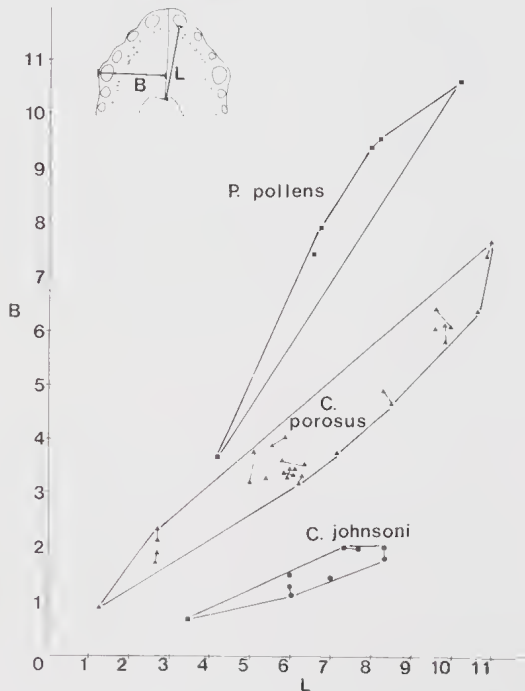


FIG. 1. Graph of half-breadth of symphyseal region (B) against index of symphyseal length (L). Squares indicate values for *Pallimnarchus pollens*, triangles for *Crocodylus porosus*, and discs for *Crocodylus johnsoni*. Values for right and left sides of one individual are linked by dashed line. Inset shows dimensions measured. See text for further comment.

adequate number of specimens was not available) which has a narrower snout and jaws than *C. porosus*.

CRANIAL MATERIAL. Of the original cranial material assigned to *P. pollens* by de Vis, the posterior portion of the maxilla (1886, pl. X, fig. 2) was not located, and the jugal has been discussed elsewhere, and assigned to *Quinkana* or a similar form (Molnar, 1981). The Lansdowne snout, assigned to *P. pollens* by Longman (1925) will be discussed later. This leaves the frontals (QM F3303), the premaxilla (QM F1151), and the incomplete quadrate (QM F1160) as the only remaining cranial material referred to *P. pollens* in the literature.

The fused right and left frontals (QM F3303) are preserved with a small portion of the left postorbital and the greater portion of the right lachrymal (Fig. 2). Anteriorly the back extremities of the nasals are present. The portion preserved is generally like the corresponding portion of *C. porosus*. There is a low lachrymal ridge, but the orbital margins are not raised and a distinct medial sulcus runs anteriorly along the nasals. The lachrymal ridge is characteristic of *C. porosus*, in which the orbital margins are usually (but not always) elevated. I have never seen a nasal sulcus on a specimen of *C. porosus*. In view of the presence of the lachrymal ridge, and the limited sample of *C. porosus* available, it is not

possible to be confident that this specimen pertains to *P. pollens* rather than to *C. porosus*.

The left premaxilla (QM F1151) is lacking only the anterior portion back to the second alveolus. It differs from premaxillae of *C. porosus* in having a transverse posterior narial margin, those of *C. porosus* being inclined posteriorly (Fig. 3). Thus it seems likely that this specimen is referable to *P. pollens*.

The right quadrate (QM F1160) is incomplete anteriorly, lacking almost half of its full length. It differs from the corresponding portion of the quadrate of *C. porosus* in two character states. In ventral aspect the lateral margin proceeds anterolaterally from the lateral condyle, rather than anteriorly as in *C. porosus* (Fig. 4). In *C. porosus* the exoccipital buttress is never removed from the medial condyle by a distance exceeding the total width of the condyles (Table 4). In QM F1160 (Pl. 2, Fig. 10) however the distance from medial condyle to exoccipital buttress exceeds the total width by 24 per cent. This character state also distinguishes this quadrate from those of *C. johnsoni* and *C. novae-guineae*

available. Thus it seems likely that QM F1160 is also referable to *P. pollens*.

These latter two specimens are referred to *P. pollens* because they differ in form from living Australasian erocodilians. They yield no compelling indication of relationship to any ziphodont form (i.e. *Quinkana*). Nonetheless in the absence of positive evidence of their association and pending discovery of articulated crania of *Pallimnarchus*, this assignment is tentative.

THE LANSDOWNE SNOOT. Originally described by Longman (1925) this snout (QM F1752) together with fragments of the postorbital region of the skull, jaws and postcranial skeleton, was found on 'Lansdowne', near Tambo, south central Queensland. The snout appears exceptionally broad and was thus assigned to *P. pollens*. In fact the ratio of the interorbital distance to the orbitopremaxillary distance is matched by some large modern specimens of *C. porosus* (G. Webb, pers. comm., 1978). This has led to re-evaluation of the taxonomic position of this specimen.



FIG. 2 Frontals and associated elements initially referred to *Pallimnarchus pollens* (QM F3303), in dorsal aspect, anterior to the top. f, frontals; l, lacrimal; n, nasal. Bar represents 1cm.



FIG. 3 Left premaxilla referred to *Pallimnarchus pollens* (QM F1151) in dorsal aspect, anterior to the top. Inset shows form of premaxillae, and external nares in *Crocodylus porosus*. Bar represents 1cm.

Longman based his assignment of the Lansdowne material to *Pallimnarchus* also on the similarity of the premaxillae to that assigned by de Vis to *Pallimnarchus* (QM F1151). However, the Lansdowne premaxillae differ from QM F1151 in the same character state as do those of *C. porosus*, namely the inclined posterior margin of the external nares (cf. Longman, 1925 fig. 1). At least one other character state of the Lansdowne snout is matched in *C. porosus*. Although the dorsal surface of the snout is crushed, especially posteriorly, and (perhaps because of this) there is no indication of either lachrymal ridge, the sulci bounding the central ridge are present (cf. Molnar, 1979). They are subdued but this is typical of the large specimens of *C. porosus* in the QM collections.

Additionally the *P. pollens* mandible (QM F2025) from Macalister, southeast Queensland, (Longman, 1926) that matches the Lansdowne snout in size, suggests that this snout is not from *P. pollens*. When the symphyseal surface of the dentary is placed in the plane of the medial junctions of the premaxillae and maxillae, to approximate the position of the dentary in life, the rear portion of the dentary projects laterally well beyond the lateral margin of the skull (Fig. 5). Because of the snout proportions, external narial form, sulci, and lack of match with QM F2025 the Lansdowne snout is considered to represent *C. porosus* and not *P. pollens*.

OTHER REFERRED MATERIAL. Other specimens in the Queensland and Australian Museums clearly pertain to *P. pollens*. Noteworthy among this

material is the dentary from Macalister (QM F2025) already mentioned. A left premaxilla (QM F1154) from Chinchilla exhibits the same transverse orientation of the posterior narial margin found in QM F1151, and hence probably derives from *Pallimnarchus*. There is also an almost complete, elongate left quadrate (QM F1165) from the Chinchilla Sand (Pl. 1, Figs. G, H). Although the lateral condyle is worn, the margin anterior to it projects laterally, unlike the condition in *C. porosus*, and the exoccipital buttress is well removed from the medial condyle (Table 4), thus matching QM F1160 referred probably to *Pallimnarchus*. Among the relatively plentiful maxillary and cranial material in the Queensland Museum none is clearly referable to *P. pollens*.

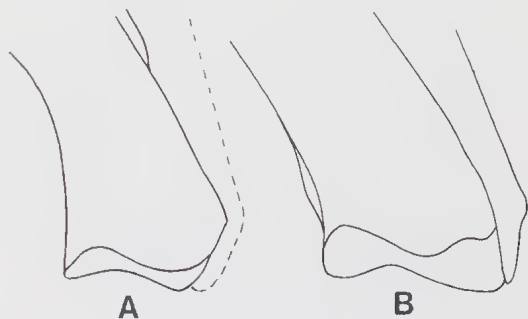


FIG. 4 Quadrates of *Pallimnarchus pollens* (A) and *Crocodylus porosus* (B) in outline in ventral aspect. Note difference in lateral outline. A drawn from QM F1162 and QM F1165, and B drawn from QM J13443. Not to scale.



FIG. 5 The Macalister mandible (*Pallimnarchus pollens*, QM F2025) in outline, superimposed on the outline of the Lansdowne snout (QM F1752). With the symphyseal surface of the jaw aligned with the medial plane of the snout, the jaw can be seen to project posteriorly beyond the lateral margin of the skull to a degree exceeding that found in modern crocodilians. This (together with other evidence) suggests that the snout does not derive from *P. pollens*. Hatched areas represent plaster reconstruction. Note that the skull is reversed.

CROCODYLUS NATHANI LONGMAN

The species *C. nathani* was erected by Longman (1924) for the reception of three dentary pieces and an incomplete cranial roof from Tara Creek, east central Queensland. To his new species, Longman also referred the symphyseal portion of a dentary (QM F1538) from the Leichhardt River, northwest Queensland. This is presumably the mandible mentioned by de Vis (1907), as *P. pollens*. The material from Tara Creek includes two portions of the anterior region of dentary (QM F1512, QM F1513) and a segment from the middle part of the jaw (QM F11609) believed by Longman to be 'probably continuous in life with F. 1512' (Longman, 1924, p. 24) and so registered at the time. The incomplete cranial roof (QM F1514) includes both frontals, portions of both laterosphenoids, and a small part of the left postorbital (Fig. 6).

Longman did not designate a holotype of *C. nathani*, but indicated that the diagnostic characters were found in the symphyseal region of the dentary, thus limiting possible type specimens to QMF1512 (Pl. 2, Figs. E, F) and QM1513 (Pl. 2, Figs. A, B.) Of these QM F1513 is the (slightly) more complete and the better preserved, and is here designated the lectotype.

Order CROCODYLIA
Suborder EUSUCHIA Huxley
Family Crocodylidae Cuvier
Genus *Crocodylus* Laurenti 1768
Species *C. nathani* Longman 1924

LECTOTYPE SPECIMEN: QMF1513. Anterior portion of left dentary lacking the anterior extremity (Pl. 2, Figs. A, B).

TABLE 4: DIMENSIONS OF THE POSTERIOR MOEITY OF THE QUADRATE.

Taxon	Number	Side	Condylar width(mm)	Distance from int. condyle to exoccipital buttress (mm)	Distance to buttress as percentage of width
<i>C. johnsoni</i>	QM J4280	r	19	16	84
<i>C. johnsoni</i>	QM J4280	l	19	13	68
<i>C. johnsoni</i>	QM J22551	r	22	17	77
<i>C. johnsoni</i>	QM J22551	l	22	16	73
<i>C. johnsoni</i>	QM J28895	l	25	16	64
<i>C. johnsoni</i>	QM J28895	i	25	20	80
<i>C. johnsoni</i>	QM J39230	r	35	26	74
<i>C. johnsoni</i>	QM J39230	l	33	30	91
<i>C. novaeguineae</i>	QM J5332	r	24	17	71
<i>C. novaeguineae</i>	QM J5332	l	23	18	78
<i>C. novaeguineae</i>	QM J5664	r	30	24	80
<i>C. porosus</i>	QM J5005	r	81	57	70
<i>C. porosus</i>	QM J5005	l	75	62	83
<i>C. porosus</i>	QM J13443	r	44	35	80
<i>C. porosus</i>	QM J13443	l	43	36	84
<i>C. porosus</i>	QM J22550	r	41	37	90
<i>C. porosus</i>	QM J22550	l	40	36	90
<i>C. porosus</i>	QM J29021	r	18	13	72
<i>C. porosus</i>	QM J29021	l	19	15	79
<i>C. porosus</i>	QM J39231	r	38	34	89
<i>C. porosus</i>	QM J39231	l	38	31	82
<i>C. porosus</i>	QM J39232	r	38	37	71
<i>C. porosus</i>	QM J39233	r	37	31	84
<i>C. porosus</i>	QM J39233	l	38	30	79
<i>C. porosus</i>	QM J39283	r	77	63	82
<i>C. porosus</i>	QM J39283	l	71	60	85
<i>C. porosus</i>	QM J39284	r	77	69	90
<i>C. porosus</i>	QM J39284	l	78	76	97
<i>C. porosus</i>	QM F1161	l	72	52	72
<i>P. pollens?</i>	QM F1160	r	66	82+	124+
<i>P. pollens?</i>	QM F1165	l	55	68	124

LOCALITY: Tara Creek, northeast Queensland.

HORIZON: Not recorded.

AGE: Probably Pliocene.

DIAGNOSIS: '... the mandibular symphysis ... extends barely parallel to the posterior border of the fourth tooth.' (Longman, 1924, p. 23).

To my knowledge this taxon was never again cited in the primary literature until I suggested it to be a synonym of *C. porosus* (Molnar, 1979), and no further material has been referred to it.

Longman distinguished this species from the other species of *Crocodylus* (and from *Pallimnarchus pollens*) using the position of the posterior end of the symphysis vis-a-vis the tooththrow. He also suggested that the enlarged

central dentary teeth were the eleventh and twelfth, rather than the tenth and eleventh as in *C. porosus* (Longman, 1924). This latter suggestion was based on his assumption that QM F11609 was continuous with QM F1512; this, however may be questioned. QM F1512 (and QM F1513) have the splenial so well fused to the dentary that no trace remains of its suture with that element, while on QM F11609 the splenial was so loosely attached that it has become separated from the dentary and lost. This indicates that these two specimens derive from two different individuals. There is no contact between the two specimens, and hence there is no evidence that the eleventh and twelfth were the enlarged dentary teeth rather than the tenth and eleventh.

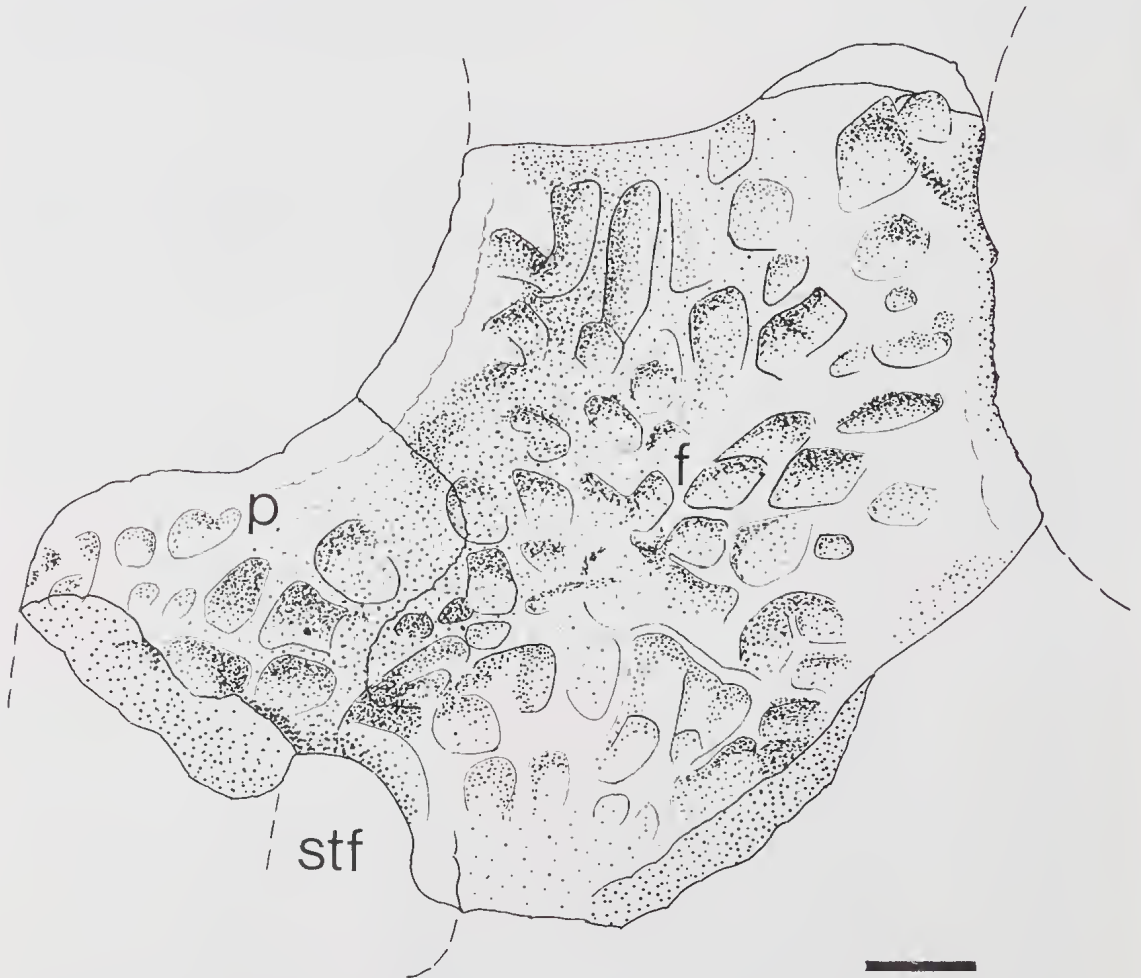


FIG. 6 Frontals (f) and postorbital (p) of *Crocodylus nathani* (= *C. porosus*) (QM F1514) in dorsal aspect, anterior to the top. stf, supratemporal fenestra. Bar represents 1cm.

Examination of the *C. nathani* dentaries (QM F1512, QM F1513) revealed the disconcerting circumstance that while Longman's photographs (1924, Pl. 3) clearly represent these two specimens, and clearly show that the posterior end of the symphysis is at the level of the fourth alveolus (and indeed well anterior to the posterior border of that alveolus) the specimens themselves show nothing of the kind. When the symphyseal surface of either of these specimens is placed against one edge of a T-square the perpendicular edge clearly intersects the fifth (not the fourth) alveolus (Fig. 7). Hence this feature cannot distinguish *C. nathani* from either *C. porosus* or *P. pollens*. The explanation of the deceptive appearance of the photographs was clarified by rotation of the specimens about their longitudinal axes: when photographed the specimens were not viewed in dorsal aspect. Instead they were photographed from a direction of about 45 degrees lateral to the vertical. This has obscured from view the more ventral part of the symphysis and given the appearance that the symphysis terminated posteriorly at the fourth alveolus.

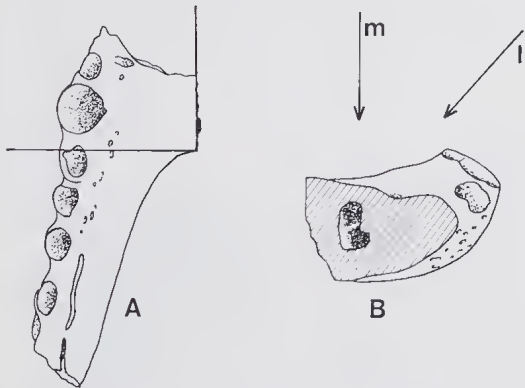


FIG. 7 Lectotype mandibular segment of *Crocodylus nathani* (= *C. porosus*) (QM F1513) in dorsal (A) and anterior (B) aspects, to illustrate orientation of specimen for plate 3 of Longman (1924). A, mandibular segment in dorsal aspect showing 5th mandibular alveolus at level of posterior end of symphysis (note that the discrepancy in position of the end of the symphysis between this figure and Pl. 2, B of this paper is due to parallax in the photograph). B, mandibular segment in anterior aspect showing direction of view (m) for Fig 7A and Pl. 2, B of this paper and that (l) for pl. 3 of Longman (1924) (l). See text for further comment.

Unfortunately neither QM F1512 nor QM F1513 is sufficiently well preserved anteriorly to permit comparison using the length: breath ratio discussed for *P. pollens*. The position of the symphysis is not distinctive, nor is there convincing evidence that the enlarged dentary teeth were different from those of *C. porosus*. In sum, no character states distinguish *C. nathani* from *C. porosus*, and thus *C. nathani* Longman becomes a junior subjective synonym of *C. porosus*.

The cranial roof fragment (QM F1514) referred to *C. nathani* consists of the greater portion of both frontals, fused at the midline, and much of the left, but only a bit of the right laterosphenoid. The left postorbital is represented by the upper portion contributing to the skull roof. The orbital margins are strongly raised as in *C. porosus*, and the sculpture of the roof closely resembles that found in that species. This piece cannot be distinguished from the corresponding portion of the skull of *C. porosus*.

The worn symphyseal region of a left dentary (QM F1538) from the Leichhardt River, referred to *C. nathani* by Longman, matches in length: breadth index other specimens referred to *P. pollens* (Fig. 1) and thus is regarded as pertaining to that species (as de Vis had believed).

CROCODYLUS POROSUS FOSSILS

Jack and Etheridge (1892) list several sites yielding fossil material of *C. porosus*. Although I have seen none of this material, other material in the Queensland Museum, in addition to the Lansdowne snout (QM F1752), may be attributed to (i.e. cannot be distinguished from) *C. porosus*. This material comprises a partial dentary from Macalister (QM F11611), a premaxilla from the Condamine River (QM F11626), and the previously described incomplete snout, (QM F9229; Molnar, 1979) and a much larger, incomplete dentary (QM F11623) both from the Allingham Fm. The partial dentary from Macalister, as well as that from the Allingham Fm., consists of the anterior portion lacking the anterior end. Both are markedly narrower in the symphyseal region than those of *P. pollens* (Pl. 1, Figs E,F). The Condamine premaxilla matches those of *C. porosus* in the inclination of the posterior margin of the external narial opening.

The Allingham material reinforces the conclusion that *C. porosus* was already present in Australia during the Pliocene (Molnar, 1979). The distribution of the material, particularly at Macalister and Tambo, also suggests that *C.*

porosus once enjoyed a considerably wider range than at present extending well into the interior of Queensland. The occurrence of material attributable to both *P. pollens* and *C. porosus* at Macalister suggests that their ranges may have overlapped, although in the absence of detailed stratigraphic information this must remain only a suggestion. The presumably Pleistocene Sand at Macalister differs both from the Chinchilla Sand and the other fluviatile deposits of the eastern Downs (Woods, 1960) so the stratigraphic relations of this bed to other deposits is unclear.

THE MURGON CROCODILE

The symphyseal region of the left dentary (QMF11625) of a small crocodilian (Pl. 2, Figs. G, H) from near Murgon, southeast Queensland, differs in general form and proportions from those of *C. porosus*, *C. johnsoni*, *C. novae-guineae* and *P. pollens*. Unfortunately the first alveolus is broken medially, so that the length:breadth index used for comparison of *P. pollens* cannot be obtained for this specimen. The symphyseal region is subtriangular in dorsal aspect, rather than

subrectangular as in *C. porosus*, or broadly rounded as in *P. pollens* (Fig. 8). The symphysis ends posteriorly at the level of the seventh dentary alveolus, farther back than in either *C. porosus* (the fifth) or *P. pollens* (the fifth or sixth). In *C. novae-guineae* the back of the symphysis is at a level between the sixth and seventh alveoli, but the form of the symphyseal region is more like that of *C. porosus*.

Viewed from above this fragment resembles a specimen from the Waite Fm. (Woodburne, 1967), and also the corresponding region of the dentary of a form, under study, from the Etadunna Fm. It differs from both of these, however, in the position of the back of the symphysis, which in both Etadunna and Waite forms is at the level of the fifth dentary alveolus.

The Murgon fragment presumably derives from the Oakdale Ss. (cf. Gaffney and Bartholomai, 1979), which is believed to be mid-Tertiary in age (Murphy et al., 1976). The similarity of this piece to the material from the Miocene Waite and Etadunna Fms. and the absence of similar material in the Plio-Pleistocene beds, suggests that the Oakdale Ss. may be Miocene in age.

TABLE 5: STRATIGRAPHIC RANGE OF CROCODYLIANS IN THE QUEENSLAND CENOZOIC*

Holocene	<i>C. porosus</i>	<i>C. johnsoni</i>		
Pleistocene	<i>C. porosus</i>		<i>P. pollens</i>	
Pliocene	<i>C. porosus</i>		<i>P. pollens</i>	
Miocene				Murgon croc (?)

* Crocodilian material has also been reported from the probably Eocene Redbank Plains Fm by Reik (1952), see Molnar 1980) for comment.

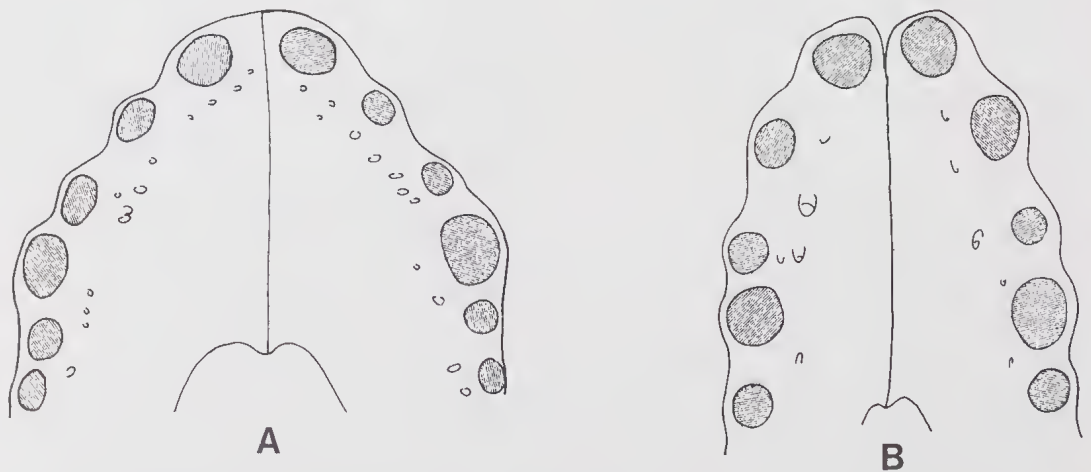


FIG. 8 Symphyseal regions, in outline, of the mandibles of *Pallimnarchus pollens* (A), and *Crocodylus porosus* (B). A based on QM F1149 (the lectotype), and B based on QM J29232. Not to scale.

DISCUSSION

Table 5 presents the temporal distribution of crocodylian taxa in Queensland from the Miocene to the present. It may be noted that there is no clear evidence of *C. johnsoni* in the fossil record: why this should be so for an endemic species is perplexing, although it seems likely that material simply has yet to be discovered. There is indication that *C. porosus* has inhabited Australia for several million years, at least since the early Pliocene (Molnar, 1979). Although *C. porosus* is now restricted to coastal rivers, during the Pliocene and Pleistocene it had apparently penetrated well inland. *P. pollens* appears to have been largely a crocodile of the inland waters.

Although *P. pollens* probably had a broader snout than *C. porosus*, there is no indication from jaw size that the skull was any larger than that of *C. porosus*. Hecht (1975) suggested that *P. pollens* had a heterodont dentition but there is no clear evidence for this assertion in any of the cranial material in the Queensland or Australian Museum collections. Indeed the teeth appear to have been generally similar to those of *C. porosus*, although some of the large isolated teeth attributed to *P. pollens* have regularly serrate carinae.

It seems likely that *Pallimnarchus* and *C. porosus* preyed upon the large marsupials of the Pliocene and Pleistocene, although doubtless feeding upon other forms as well.

CONCLUSIONS

Much material that has been attributed to *Pallimnarchus pollens*, at least in the Queensland Museum collections, cannot be certainly identified. Some of this material is not distinguishable from *C. porosus*. Some is clearly distinct from *C. porosus* and is attributed to *P. pollens*. Longman's *C. nathani* cannot be distinguished from *C. porosus*, and thus is a junior subjective synonym of *C. porosus*. Both *P. pollens* and *C. porosus* material dates well into the Pliocene in age. Although now restricted to the coastal drainage, *C. porosus* penetrated well into the interior waters during the past. The large snout from Lansdowne, near Tambo, is attributed to *C. porosus* rather than *P. pollens*, on the basis of its proportions, external narial form, and dorsal sulci. Comparison of this snout with the *P. pollens* mandible from Macalister indicates that the snout of *P. pollens* must have been proportionately even broader than that of the Lansdowne specimen. There is no clear indication of *C. johnsoni* in the fossil record. A

distinctive dentary piece from Murgon shows similarities to Miocene crocodylian material from South Australia and the Northern Territory, and suggests that the beds from which it derives (probably the Oakdale Ss.) may be Miocene.

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PLATE 1

FIGS. A, B. Lectotype mandible (QM F1149) of *Pallimnarchus pollens* de Vis in ventral (A) and dorsal (B) aspects. Scale bar represents 2 cm here, all other scale bars represent 1 cm.

FIGS. C, D. Symphyseal platform of mandible (QM F11612) of *P. pollens* in ventral (C) and dorsal (D) aspects.

FIGS. E, F. Right side of symphyseal region of mandible (QM F11611) attributed to *Crocodylus porosus* in lateral (E) and dorsal (F) aspects. The symphyseal region here is narrower than in *P. pollens*. Note that this specimen is broken anteriorly at the level of the second alveolus, so that about 25% of the length of the symphysis is missing.

FIGS. G, H. Left quadrate (QM F1166) referred to *P. pollens* in ventral (G) and lateral (H) aspects. Anterior is to the left.

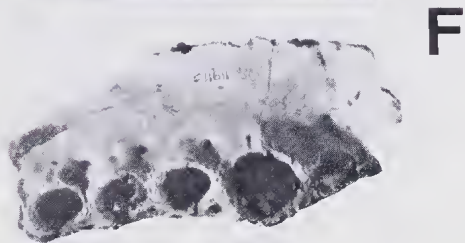
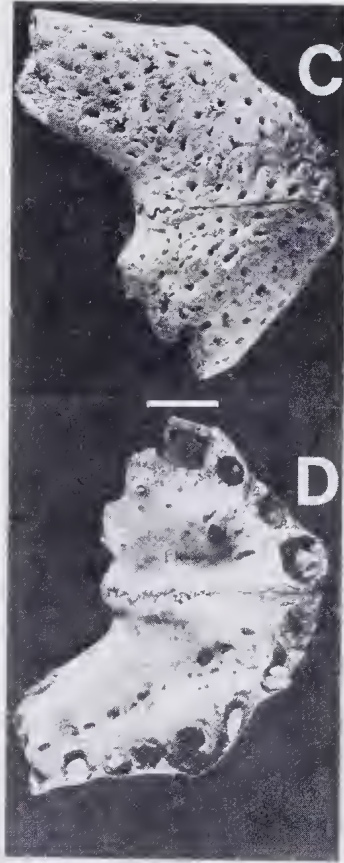
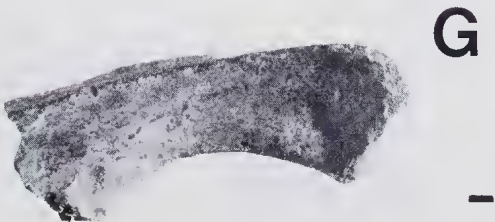
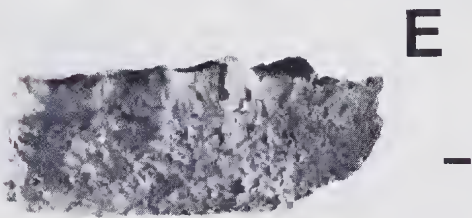


PLATE 2

- FIGS. A, B. Lectotype mandible (QM F1513) of *Crocodylus nathani* Longman, in lateral (A) and dorsal (B) aspects. All scale bars represent 1 cm.
- FIGS. C, D. Worn left symphyseal region of mandible (QM F1538) referred to *C. nathani* by Longman (124), but now recognized as *Pallimnarchus pollens*, in lateral (C) and dorsal (D) aspects.
- FIGS. E, F. A second specimen (QM F1512) representing the same portion of the dentary as the lectotype from the hypodigm of *C. nathani* in lateral (E) and dorsal (F) aspects.
- FIGS. G, H. Left symphyseal region (QM F11625) from possibly Miocene crocodylian in lateral (G) and dorsal (H) aspects. Specimen from near Murgon, southeast Queensland.
- FIG. I. Incomplete left angular (QM F11610), associated in QM collections with lectotype mandible (QM F1149) of *Pallimnarchus pollens*, in medial aspect. Anterior is to the right.
- FIG. J. Incomplete left quadrate (QM F1160) of *P. pollens* in ventral aspect. Anterior is to the top.

